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(54) Suture loop locking device

Einrichtung zur Fixierung einer Nahtschlinge

Dispositif de blocage d'une boucle de suture

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Description

BACKGROUND OF THE INVENTION

1. Field Of The Invention

The present invention relates to surgical devices and more particularly to a suture device for securing a suture loop which is passed through or about bodily tissue. Such a device has particular application in endoscopic and laparascopic surgical procedures. A suture loop securing device is disclosed in US-A-3845772, but not suggested for use in endoscopic or laparoscopic surgery. Nevertheless, it serves as basis for the precharacterising part of claim 1 below.

2. Discussion of the Prior Art

Suturing of bodily tissue is a time consuming component of most surgical procedures including both conventional surgery and endoscopic surgery. Typically, suturing is accomplished by passing a needle through tissue and tieing the free ends of the suture together with a knot. In conventional surgery, the suturing site is exposed sufficiently to permit the surgeon to tie the suture by hand. However, in endoscopic and laparoscopic surgery, the suture ends are often tied into a knot at a location remote from the tissue site. The knot is then manipulated with an appropriate endoscopic instrument to slide the knot to the targeted tissue.

A particular objective in tieing off a suture around tissue is achieving the appropriate tension on the suture material to accommodate the particular tissue being sutured so as to control approximation, occlusion, attachment or other conditions of the tissue. However, the surgeon's ability to apply the appropriate level of tension to the suture is often inhibited, particularly in endoscopic surgery where suturing is performed with the use of an elongated endoscopic instrument, which instrument requires numerous difficult manipulations to perform the suturing procedure. Due to the difficult manipulations required, the integrity of the suture knot formed is frequently in question and the time expended to form this knot is often excessive, thus, offsetting the inherent advantages of the endoscopic and laparoscopic surgical techniques, i.e., reduced operative time and trauma to the patient.

Accordingly, it would be desirable to provide a suture device which can tie off a suture loop about tissue in an effective and efficient manner. It would also be desirable to provide a device which facilitates the surgeon's ability to control the amount of tension exerted on the suture loop. The present invention makes available a locking device which facilitates quick knotting and tieing as needed during critical surgical procedures, which device can be utilized in both conventional and endoscopic surgery.

SUMMARY OF THE INVENTION

The technical features which characterise the present invention are recited in claim 1 below.

A device for securing a suture loop about tissue portion comprises, in accordance with the invention, a bead member having a longitudinal bore extending therethrough and an anchor member slidably insertable within the bore of the bead member. The anchor member defines a longitudinal passageway for reception of two end portions of a suture loop. The anchor member assumes a compressed condition upon at least partial insertion thereof within the bore of the bead member to securely wedge the suture end portions received within the passageway to retain the suture loop about a selected portion of bodily tissue.

The anchor member may include at least two axial compressible sections which define therebetween the longitudinal passageway for reception of the two suture end portions. The axial sections are adapted to collapse radially inwardly towards a longitudinal axis defined by the anchor member when the anchor member is at least partially inserted within the bore of the bead member.

The axial sections may define inner wedging surfaces which engage the suture end portions when in the collapsed position.

In a preferred embodiment, the anchor member comprises four axial compressible sections which are generally quadrantal-shaped in cross-section. The wedging surfaces of the four axial compressible sections may each define an arcuate recess. The arcuate recesses are configured and dimensioned to accommodate the two suture end portions of the suture loop. In an alternative preferred embodiment, the anchor member comprises first and second pairs of opposed axial sections. The wedging surfaces of the first pair are generally straight while the wedging surface of the second pair include arcuate recesses.

The axial sections may also each include at least one flange portion disposed on an outer peripheral surface thereof. The flange portions are configured and dimensioned to increase the effective outer diameter of the anchor member so as to maximize the amount of inward movement of the axial sections towards the longitudinal axis defined by the anchor member upon insertion thereof in the bore of the bead member. Preferably, the flange portions taper outwardly towards the rear end portion of the anchor member to facilitate insertion of the anchor member within the bead member. In the preferred embodiment, the axial sections each comprise a pair of flange portions.

The device of the present invention can be used in a method for securing a suture about tissue. The method comprises the steps of looping a suture about tissue, sliding a bead member having a longitudinal bore extending therethrough over the two ends of the suture such that the suture ends are received within the longitudinal bore, advancing the bead member to a pre-

determined position adjacent the tissue portion, inserting the two suture ends within a longitudinal passageway defined in an anchor member, and advancing the anchor member along the two suture end portions and into the longitudinal bore of the bead member such that the anchor member assumes a collapsed condition whereby the suture end portions are securely wedged between inner wedging surfaces of the anchor member to retain the looped suture about the tissue.

In an alternative method using the device of the invention, the bead member and anchor member are pre-assembled, i.e., the bead member is partially inserted within the anchor member prior to application of the device over the suture loop. Accordingly, the pre-assembled device is slid over the two suture ends and the device is advanced to a predetermined position adjacent the tissue portion. The suture loop is further tightened, if desired, by pulling on the suture ends. Thereafter, the anchor member is completely inserted within the bead member to secure the device.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will be described hereinbelow with reference to the drawings wherein:

FIG. 1 is a perspective view of the suture loop locking device of the present invention illustrating the bead member and the anchor member;

FIG. 2 is a top view of the anchor member of the locking device of FIG. 1;

FIG. 3 is a side view of the anchor member of the locking device of FIG. 1;

FIGS. 4-6 are side views of the locking device of FIG. 1 illustrating the sequence of steps for applying the locking device to secure a suture loop about tissue in accordance with a preferred method of the present invention;

FIGS. 7-8 are side views illustrating an alternative method for applying the locking device of the present invention wherein the locking device is in a pre-assembled condition prior to application thereof to the suture loop;

FIG. 9 is a side-sectional view of the locking device in a secured position;

FIG. 10 is a cross-sectional view taken along the lines 10-10 of FIG. 9 illustrating the anchor member completely inserted within the bead member to securely wedge the suture end portions received within the anchor member;

FIG. 11 is a top view of an alternative embodiment of the anchor member of FIG. 1; and

FIG. 12 is a top view of the anchor member of FIG. 11 completely inserted within the bead member to securely wedge the suture end portions received within the anchor member.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring initially to FIG. 1, there is illustrated a perspective view of the suture loop locking device constructed according to the present invention. Locking device 10 has particular application in securing a suture loop about bodily tissue. Particularly, locking device 10 may be used to secure a suture loop about split portions of tissue for healing purposes or may be used to ligate tissue, e.g. a blood vessel. Other applications for locking device 10 may be readily appreciated by one skilled in the art such as attachment of tissue portions. Locking device 10 may be used in conjunction with endoscopic and laparoscopic surgical procedures.

Referring now to FIGS. 1-3, locking device 10 includes bead member 12 having longitudinal bore 14 and anchor member 16. Bead 12 is adapted to receive anchor 16 through bore 14. Anchor 16 is preferably generally frusto-conically shaped and includes a lower cylindrical portion 18 and four axial compressible sections 20 integrally connected to the cylindrical portion 18. Cylindrical portion 18 has a diameter slightly less than the inner diameter of bore 14 and defines a generally elongated aperture 22 to receive two end portions of a suture. Preferably, the dimension of aperture 22 approximates the dimensions of the outer diameters of the two suture end portions.

Axial sections 20 are generally quadrantal in shape in cross-section and flare outwardly to define the general frusto-conical shape of anchor 16. Axial sections 20 define a longitudinal passageway 24 through the central portion of anchor 16 through which the suture end portions received within aperture 22 may pass during suture tightening. Axial sections 20 are separated by partial longitudinal channels 26 which enable the sections to collapse radially inwardly upon insertion of anchor 16 within bore 14 of bead 12 to a strap securing position. In this position, the suture end portions are securely wedged between wedging surfaces 28 defined in the inner surfaces of axial sections 20 to secure the suture loop in a locked condition about the tissue. Wedging surfaces 28 are preferably arcuately-shaped as shown to accommodate the circular dimensions of the suture end portions. Preferably, axial sections 20 are configured to provide wedging surfaces along a substantial axial length of anchor 16. Such configuration will increase the surface area of the suture portion engaged by anchor 16, and, accordingly, will provide a more effective wedging action.

Each axial section 20 includes a pair of outwardly extending flange portions 30, 32 on its outer peripheral surface. Flange portions 30, 32 are correspondingly dimensioned and positioned to increase the effective outer diameter of the frusto-conically shaped anchor 16 so as to maximize the inward movement of axial sections 20 towards the central axis defined by the anchor during insertion thereof in bead 12, thus increasing the wedging action on the suture end portions. Flange portions 30, 32 slope outwardly away from cylindrical portion 18 to facilitate introduction of anchor 16 within bore 14. Anchor 16 and flange portions 30,32 are advantageously dimensioned such that the suture end portions may advance through the anchor when the anchor is partially inserted within bead 12, i.e., when flange portions 30 are received within the bead.

The components of bead 12 and anchor 16 may be fabricated from synthetic absorbable materials including polymers or copolymers of glycolide, lactide, trimethylene carbonate, dioxanone, caprolactone or blends thereof or nonabsorbable fibers including polycarbonate, polyesters, polyethylene, polyamides, polyvinyl chlorides, polypropylenes, polytetrafluoroethylene, polysulfones, acrylics and polypropylene. It is also within the scope of the present invention for device 10 to be fabricated from a combination of such absorbable and nonabsorbable materials. Preferably, device 10 is advantageously dimensioned so that it may be used in minimally invasive surgical techniques, i.e., endoscopic and laparoscopic surgery.

Further understanding of locking device 10 of the present invention will be readily appreciated from the following description of the application of same about split portions of tissue for healing purposes.

Referring initially to FIG. 4, there is illustrated a suture 40 looped about tissue portions 50, 50, with suture end portions 42, 42 inserted through longitudinal bore 14 of bead 12 and through aperture 22 defined in cylindrical portion 18 of anchor 16. Referring now to FIG. 5, bead 12 is advanced towards tissue portions 50, 50 until the bead is at a desired position adjacent the tissue portions. Suture ends 42, 42 are pulled in a tensioning direction through passageway 24 to tighten suture 40 about tissue portions 50, 50 to a predetermined desired tension. In this procedure, the suture loop is tightened such that the tissue portions are in an adjacent compressed relation. While maintaining a firm grip on suture ends 42, 42, anchor 16 is advanced in the direction indicated by the arrow towards bead 12 until the anchor is partially received within the bore as shown in FIG. 6. The suture may be further tightened or loosened about tissue portions 50, 50 if desired since anchor 16 is not completely secured within bead 12. In particular, anchor 16 is particularly dimensioned such that the suture end portions 42,42 are capable of sliding through the anchor with slight resistance when the first set of flanges 30 is received within bore 16 of bead 14.

In an alternative preferred method, device 10 is partially assembled prior to application to the suture 40. In particular, anchor 16 is partially inserted within bore 14 of bead 12 such that flanges 30 are disposed within the bead as shown in FIG. 7. In accordance with this method, bead 12 and partially inserted anchor 16 are positioned over suture end portions 42,42 and advanced along the end portions towards tissue portions 50, 50 as shown in FIG. 8 to the desired position adjacent the tissue portions (shown in FIG. 6). The suture 40 may be further tightened about tissue portions 50,50 if desired since the wedging action provided by flanges 30 is not sufficient to completely secure anchor 16 within bead 12.

Once the device is in the desired position shown in FIG. 6, by either of the afore-described methods, anchor 16 is forced completely within bore 14 of bead 12 to collapse axial sections 20 radially inwardly about the two suture portions ends as illustrated in FIG. 9. In this position, the suture portions are securely wedged between arcuate wedging surfaces 28 of axial sections 20 to secure the looped suture 40 about tissue portions 50, 50 and to sustain this looped configuration during healing of the tissue. FIG. 10 illustrates in cross-section the wedging action of wedging surfaces 28 on the two suture portions.

Locking device 10 may be applied to and secured about the tissue by hand or with appropriate grasping instrumentation. In endoscopic and laparoscopic surgery, the device 10 may be applied with endoscopic forceps or the like which are introduced through appropriately positioned trocar sleeves. The device is particularly useful in such surgical procedures because it can be readily applied to the suture loop and secured thereto with minimal difficulty and in less time as compared to conventional techniques for securing suture. The device also provides a means to control the amount of tension in the suture loop during final securement of the device. In particular, the surgeon can maintain or adjust the amount of tension exerted on the strap by pulling on the suture ends while simultaneously driving the anchor member 16 into the bead 12 to finally secure the device.

Referring now to FIGS. 11-12, an alternative embodiment of the anchor member of the present invention is illustrated. Anchor 60 includes first and second opposed pairs of axial compressible sections 62, 64. The first pair defines generally straight wedging surfaces 66 which engage a substantial surface portion of each of the suture ends 42 when in the secured wedged position shown in FIG. 10. The second pair 64 defines wedging surfaces 68 having arcuate portions which are dimensioned to receive suture material overflow caused by the wedging action of the first pair of wedging surfaces 66. In all other respects, this embodiment is similar to the embodiment of FIG. 1.

The claims which follow identify embodiments of the invention additional to those described in detail above.

Claims

1. A device (10) for securing a suture loop (40) about tissue portion (50), which comprises:

   bead member (12) having a longitudinal bore (14) extending therethrough; and
   an anchor member (16) which co-operates with the bead member at one end of the bore to anchor the suture loop with respect to tension in the suture in the bore;
   characterised in that:
   the anchor member is slidably insertable within said bore of said bead member and defines a longitudinal passageway (24) for reception of two end portions (42) of a suture loop, said anchor member assuming a compressed condition upon at least partial insertion thereof within said bore of said bead member, thereby to grip the suture end portions received within said passageway to retain the suture loop against said tension.

2. The device according to claim 1, wherein said anchor member (16) comprises at least two axial compressible sections (20), said at least two axial sections adapted to collapse radially inwardly towards a longitudinal axis defined by said anchor member when said anchor member is at least partially inserted within said bore of said bead member to securely wedge the suture end portions.

3. The device according to claim 2, wherein said at least two axial sections define inner wedging surfaces (28) which securely engage the suture end portions when said anchor member is in said compressed condition.

4. The device according to claims 1, 2 or 3, wherein said anchor member (16) is generally frusto-conically shaped.

5. The device according to claim 4, wherein the outer diameter of at least a portion (18) of said anchor member is greater than the diameter of said longitudinal bore of said bead member.

6. The device according to claim 3, wherein said at least two axial sections each include at least one flange portion (30, 32) disposed on an outer peripheral surface thereof, said flange portions correspondingly dimensioned and positioned to increase the effective outer diameter of said anchor member so as to maximize the amount of inward movement of said axial sections towards said longitudinal axis defined by said anchor member upon insertion thereof in said bore of said bead member.

7. The device according to claim 6, wherein said flange portions taper outwardly towards a rear end portion of said anchor member to facilitate insertion of said anchor member within said bead member.

8. The device according to claims 6 or 7, wherein said at least two axial sections each comprise a pair of said flange portions.

9. The device according to any one of the preceding claims, wherein said anchor member (16) comprises four axial compressible sections (20), each generally quadrantal-shaped in cross-section.

10. The device according to any one of the preceding claims, wherein particular wedging surfaces (28) of the anchor member each define an arcuate recess, said arcuate recesses being configured and dimensioned to accommodate the two suture end portions (42) of the suture loop (40).

11. The device according to any one of the preceding claims, wherein said anchor member (16) comprises first and second pairs of opposed axial sections, said wedging surfaces of said first pair being generally straight and said wedging surfaces (28) of said second pair including arcuate recesses.

12. The device according to any one of the preceding claims, including a forward end wall of said anchor member (16) within which is an opening (22) communicating with said longitudinal passageway (24) of said anchor member, said opening being capable of accommodating two suture end portions side by side.

13. A device according to any one of the preceding claims, wherein said bead member and/or said anchor member comprises nonabsorbable synthetic fibers selected from polycarbonate, polyesters, polyethylene, polyamides, polyvinyl chlorides, polypropylenes, polytetrafluoroethylene and polysulfones and/or bioabsorbable fibers selected from catgut and synthetic materials including polymers and copolymers of lactide, glycolide, dioxanone, caprolactone and trimethylene carbonate.

14. A device as claimed in any one of the preceding claims in which the bead and anchor are preassembled mutually engaged.

15. A device as claimed in any one of the preceding claims and including a suture to form said loop.

16. A device as claimed in claim 15 and capable of assuming a partially inserted condition and a fully inserted condition, with successive increments of insertion of the anchor into the bore of the bead,

whereby the suture may be pulled through the anchor (16), in the direction of the bore (14) of the bead (12), when the anchor is in the partially inserted condition, but not in the fully inserted condition.

17. A device as claimed in claim 16, wherein the partially inserted condition corresponds to a partially compressed condition in the anchor member.

Patentansprüche

1. Vorrichtung (10) zum Befestigen einer Nahtschlinge (40) um einen Gewebebereich (50), umfassend:

   ein perlenförmiges Element (12) mit einer Längsbohrung (14), die sich durch dieses hindurch erstreckt; und

   ein Verankerungselement (16), das mit dem perlenförmigen Element an einem Ende der Bohrung zusammenwirkt, um die Nahtschlinge in bezug auf eine Zugkraft des Nahtmaterials in der Bohrung zu verankern;
   dadurch gekennzeichnet, daß:

   das Verankerungselement verschiebbar in die Bohrung des perlenförmigen Elementes einführbar ist und einen Längsdurchtritt (24) zur Aufnahme von zwei Endbereichen (42) der Nahtschlinge begrenzt, wobei das Verankerungselement auf das zumindest teilweise Einführen desselben in die Bohrung des perlenförmigen Elementes einen zusammengedrückten Zustand einnimmt und damit die Endbereiche des Nahtmaterials, die in dem Durchtritt aufgenommen sind, greift, um die Nahtschlinge gegen die Zugkraft zu halten.

2. Vorrichtung gemäß Anspruch 1, wobei das Verankerungselement (16) zumindest zwei axial zusammendrückbare Abschnitte (20) umfaßt und die zumindest zwei axialen Abschnitte dazu geeignet sind, sich nach innen in Richtung einer Längsachse zusammenzubiegen, die durch das Verankerungselement definiert ist, wenn das Verankerungselement zumindest teilweise in die Bohrung des perlenförmigen Elementes eingeführt ist, um die Endbereiche des Nahtmaterials sicher zu verkeilen.

3. Vorrichtung gemäß Anspruch 2, wobei die zumindest zwei axialen Abschnitte innere Keiloberflächen (28) definieren, die sicher in Eingriff treten mit den Endbereichen des Nahtmaterials, wenn das Verankerungselement in dem zusammengedrückten Zustand ist.

4. Vorrichtung gemäß Ansprüchen 1, 2 oder 3, wobei das Verankerungselement (16) im allgemeinen kegelstumpfförmig geformt ist.

5. Vorrichtung gemäß Anspruch 4, wobei der Außendurchmesser zumindest eines Bereichs (18) des Verankerungselementes größer als der Durchmesser der Längsbohrung des perlenförmigen Elementes ist.

6. Vorrichtung gemäß Anspruch 3, wobei die zumindest zwei axialen Abschnitte beide zumindest einen Flanschbereich (30, 32) aufweisen, der auf einer äußeren Umfangsoberfläche desselben angeordnet ist, wobei die Flanschbereiche entsprechend dimensioniert und angeordnet sind, um den effektiven Außendurchmesser des Verankerungselementes so zu erhöhen, um das Maß an Bewegung nach innen der axialen Abschnitte in Richtung der Längsachse, die durch das Verankerungselement definiert ist, auf das Einführen derselben in die Bohrung des perlenförmigen Elementes zu maximieren.

7. Vorrichtung gemäß Anspruch 6, wobei sich die Flanschbereiche nach außen in Richtung eines hinteren Endbereichs des Verankerungselementes verjüngen, um das Einführen des Verankerungselementes in das perlenförmige Element zu erleichtern.

8. Vorrichtung gemäß Anspruch 6 oder 7, wobei zumindest zwei axiale Abschnitte beide ein Paar der Flanschbereiche umfassen.

9. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei das Verankerungselement (16) vier axial zusammendrückbare Abschnitte (20) aufweist, die im allgemeinen mit einem viertelkreisförmigen Querschnitt geformt sind.

10. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei besondere Keiloberflächen (28) des Verankerungselementes alle eine bogenförmige Aussparung begrenzen, wobei die bogenförmigen Aussparungen gestaltet und dimensioniert sind, um die zwei Nahtmaterial-Endbereiche(42) der Nahtschlinge (40) aufzunehmen.

11. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei das Verankerungselement (16) erste und zweite Paare von entgegengesetzten axialen Abschnitten umfaßt und die Keiloberflächen des ersten Paares im allgemeinen gerade sind und die Keiloberflächen (28) des zweiten Paares bogenförmige Aussparungen aufweisen.

12. Vorrichtung gemäß einem der vorhergehenden

Ansprüche, umfassend eine vordere Endwand des Verankerungselementes (16), in der eine Öffnung (22) in Verbindung mit dem Längsdurchgang (24) des Verankerungselementes ist, wobei die Öffnung zwei Nahtmaterial-Endbereiche Seite an Seite aufnehmen kann.

13. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei das perlenförmige Element und/oder das Verankerungselement nicht absorbierbare synthetische Fasern umfaßt, die ausgewählt sind aus Polycarbonat, Polyestern, Polyethylen, Polyamiden, Polyvinylchloride, Polypropylene, Polytetrafluorethylene und Polysulfone und/oder bioabsorbierbare Fasern, die ausgewählt sind aus Katgut und synthetischen Materialien einschließlich Polymere und Copolymere aus Lactid, Glycolid, Dioxanon, Caprolacton und Trimethylencarbonat.

14. Vorrichtung gemäß einem der vorhergehenden Ansprüche, bei der das perlenförmige Element und das Verankerungselement in wechselseitigem Eingriff vormontiert sind.

15. Vorrichtung gemäß einem der vorhergehenden Ansprüche und umfassend ein Nahtmaterial, um die Schlinge zu bilden.

16. Vorrichtung gemäß Anspruch 15 und dazu in der Lage, einen teilweise eingeführten Zustand und einen vollständig eingeführten Zustand einzunehmen mit fortschreitenden Schritten des Einführens der Verankerung in die Bohrung der Perle, wobei das Nahtmaterial durch die Verankerung (16) in der Richtung der Bohrung (14) der Perle (12) gezogen werden kann, wenn die Verankerung in dem teilweise eingeführten Zustand, aber nicht in dem vollständig eingeführten Zustand ist.

17. Vorrichtung gemäß Anspruch 16, wobei der teilweise eingeführte Zustand einen teilweise zusammengedrückten Zustand im Verankerungselement entspricht.

Revendications

1. Dispositif (10) pour fixer une boucle de suture (40) autour d'une portion de tissu (50) qui comprend :

   un élément de manchon (12) ayant un perçage longitudinal (14) s'étendant à travers celui-ci ; et
   un élément d'ancrage (16) qui coopère avec l'élément de manchon à une extrémité du perçage afin d'ancrer la boucle de suture relativement à la tension dans la suture dans le perçage ;

   caractérisé en ce que :

   l'élément d'ancrage peut être inséré de manière coulissante dans ledit perçage dudit élément de manchon et définit un passage longitudinal (24) pour la réception de deux portions d'extrémité (42), d'une boucle de suture, ledit élément d'ancrage se trouvant dans un état comprimé à la suite d'une insertion au moins partielle de celui-ci dans ledit perçage dudit élément de manchon en saisissant ainsi les portions d'extrémité de suture reçues dans ledit passage afin de retenir la boucle de suture à l'encontre de ladite tension.

2. Dispositif selon la revendication 1, où ledit élément d'ancrage (16) comprend au moins deux sections axiales compressibles (20), lesdites au moins deux sections axiales étant aptes à s'affaisser radialement vers l'intérieur vers un axe longitudinal défini par ledit élément d'ancrage lorsque ledit élément d'ancrage est au moins partiellement inséré dans ledit perçage dudit élément de manchon pour coincer d'une manière sûre les portions d'extrémité de suture.

3. Dispositif selon la revendication 2, où lesdites au moins deux sections axiales définissent des surfaces de coin intérieures (28) qui sont mises en prise d'une manière sûre avec les portions d'extrémité de suture lorsque ledit élément d'ancrage se trouve dans ledit état comprimé.

4. Dispositif selon les revendications 1, 2 ou 3, où ledit élément d'ancrage (16) a une forme généralement tronconique.

5. Dispositif selon la revendication 4, où le diamètre extérieur d'au moins une portion (18) dudit élément d'ancrage est plus grande que le diamètre dudit perçage longitudinal dudit élément de manchon.

6. Dispositif selon la revendication 3, où lesdites au moins deux sections axiales comprennent chacune au moins une portion de rebord (30, 32) disposée sur une surface périphérique extérieure de celles-ci, lesdites portions de rebord étant dimensionnées et positionnées de manière correspondante pour augmenter le diamètre extérieur effectif dudit élément d'ancrage de manière à amener à un maximum la quantité de mouvement vers l'intérieur desdites sections axiales vers ledit axe longitudinal défini par ledit élément d'ancrage lors de l'insertion de celui-ci dans ledit perçage dudit élément de manchon.

7. Dispositif selon la revendication 6, où lesdites portions de rebord diminuent vers l'extérieur, vers une portion d'extrémité arrière dudit élément d'ancrage

afin de faciliter l'insertion dudit élément d'ancrage dans ledit élément de manchon.

8. Dispositif selon les revendications 6 ou 7, où lesdites au moins deux sections axiales comprennent chacune une paire desdites portions de rebord.

9. Dispositif selon l'une des revendications précédentes, où ledit élément d'ancrage (16) comprend quatre sections axiales compressibles (20), chacune ayant généralement une forme quadrantale en section transversale.

10. Dispositif selon l'une des revendications précédentes, où des surfaces de coin particulières (28) de l'élément d'ancrage définissent chacune un évidement arqué, lesdits évidements arqués étant configurés et dimensionnés pour loger les deux portions d'extrémité de suture (42) de la boucle de suture (40).

11. Dispositif selon l'une des revendications précédentes, où ledit élément d'ancrage (16) comprend des première et deuxième paires de sections axiales opposées, lesdites surfaces de coin de ladite première paire étant généralement rectilignes et lesdites surfaces de coin (28) de ladite deuxième paire incluant des évidements arqués.

12. Dispositif selon l'une des revendications précédentes, incluant une paroi d'extrémité avant dudit élément d'ancrage (16) dans lequel se trouve une ouverture (22) communiquant avec ledit passage longitudinal (24) dudit élément d'ancrage, ladite ouverture étant apte à loger deux portions d'extrémité de suture côte à côte.

13. Dispositif selon l'une des revendications précédentes, où ledit élément de manchon et/ou ledit élément d'ancrage comprend des fibres synthétiques non résorbables choisis parmi les polycarbonate, polyesters, polyéthylène, polyamides, chlorures de polyvinyl, polypropylènes, polytétrafluoroéthylène et polysulfones et/ou des fibres biorésorbables choisies parmi le catgut et des matières synthétiques incluant des polymères et des copolymères de lactide, glycolide, dioxanone, caprolactone et triméthylène carbonate.

14. Dispositif selon l'une des revendications précédentes, où le manchon et l'ancre sont mutuellement en prise par pré-assemblage.

15. Dispositif selon l'une des revendications précédentes, et incluant une suture pour former ladite boucle.

16. Dispositif selon la revendication 15, et apte à assumer un état partiellement inséré et un état entièrement inséré, avec des incréments d'insertion successifs de l'ancre dans le perçage du manchon, par quoi la suture peut être tirée à travers l'ancre (16), dans la direction du perçage (14) du manchon (12) lorsque l'ancre se trouve dans l'état partiellement inséré mais non pas dans l'état complètement inséré.

17. Dispositif selon la revendication 16, où l'état partiellement inséré correspond à un état partiellement comprimé de l'élément d'ancrage.

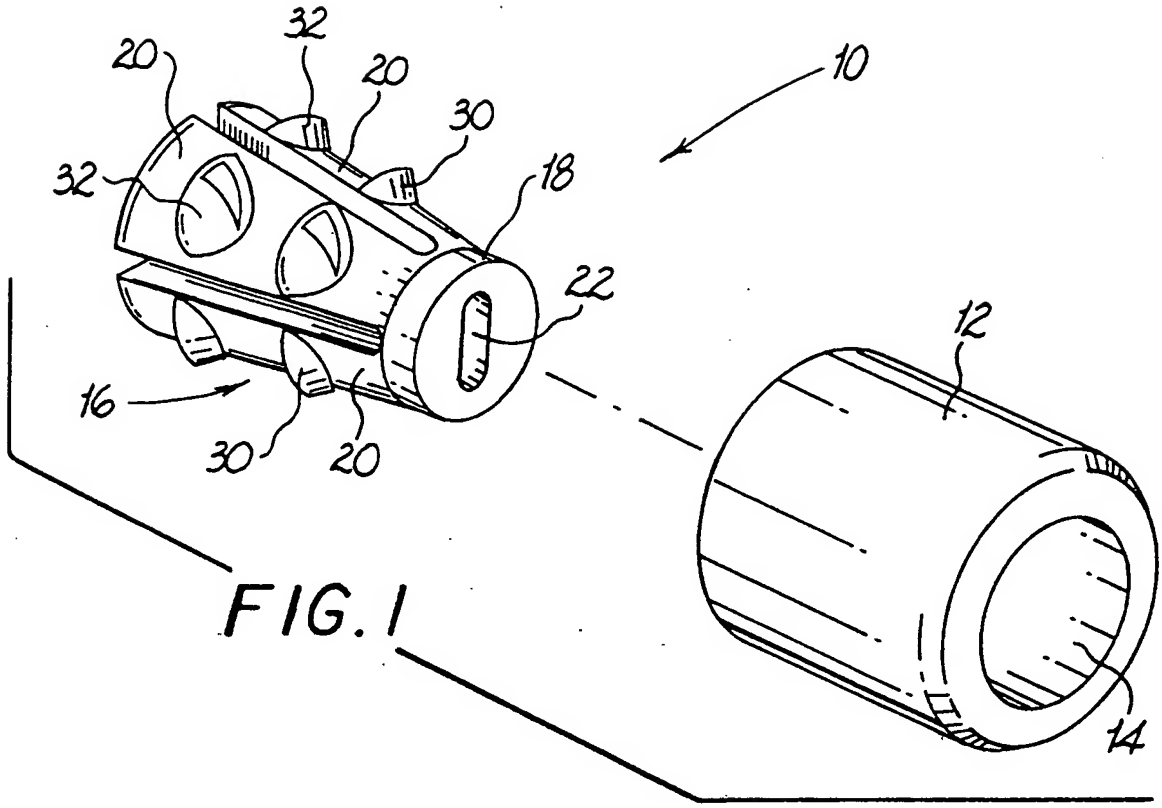

FIG. 1

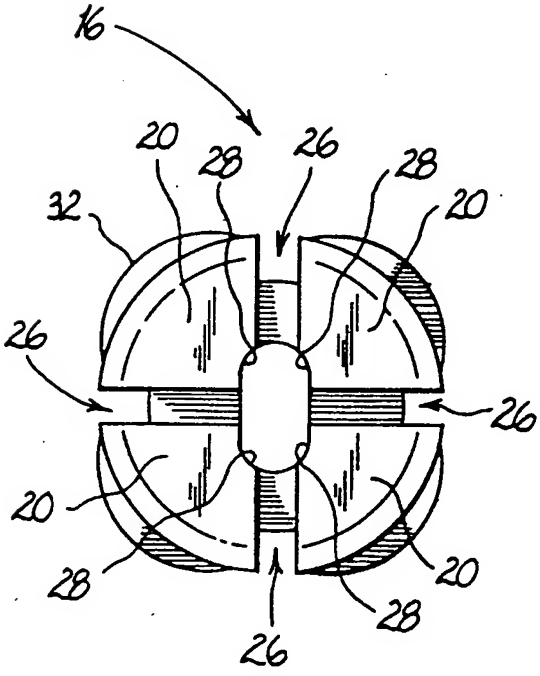

FIG. 2

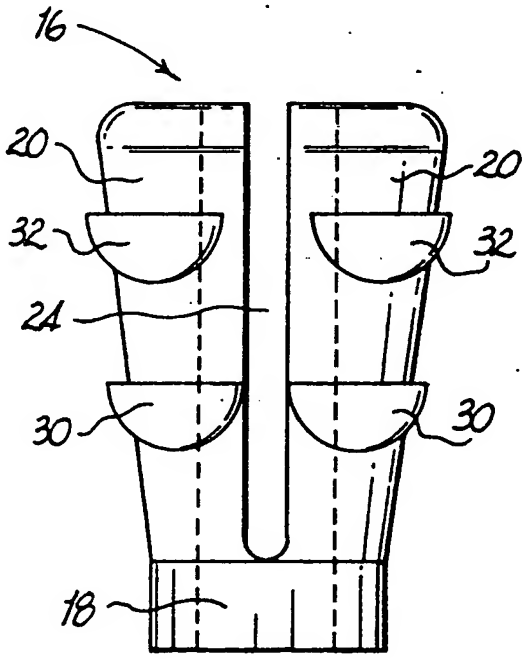

FIG. 3

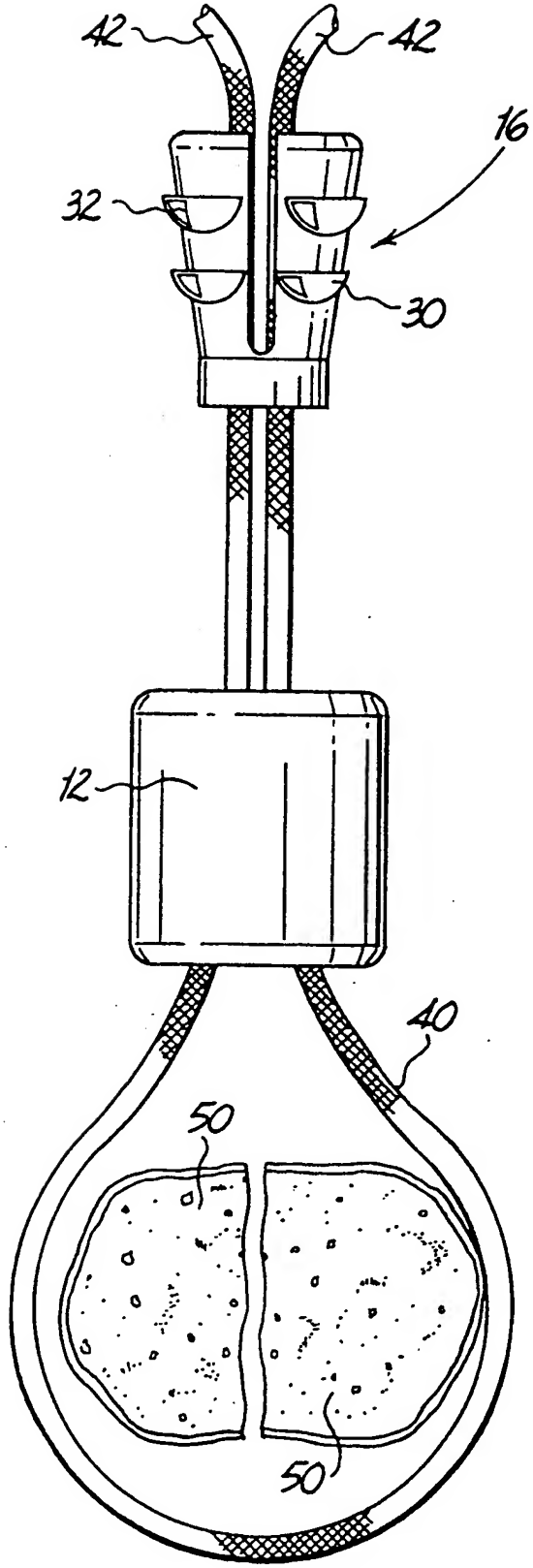

FIG. 4

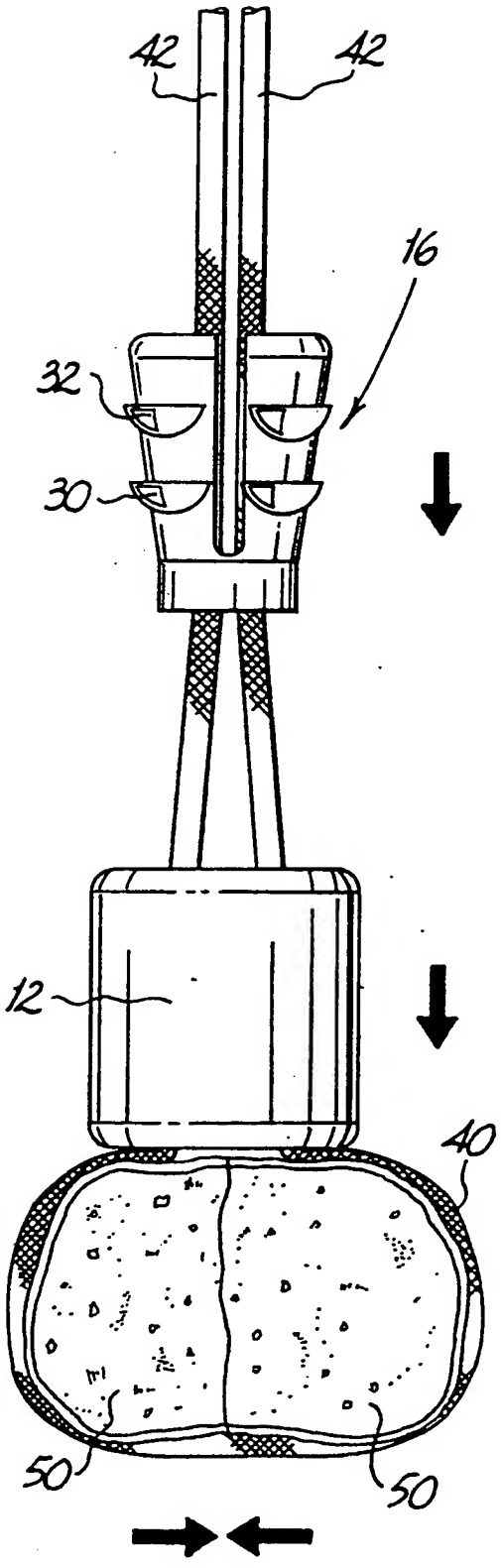

FIG. 5

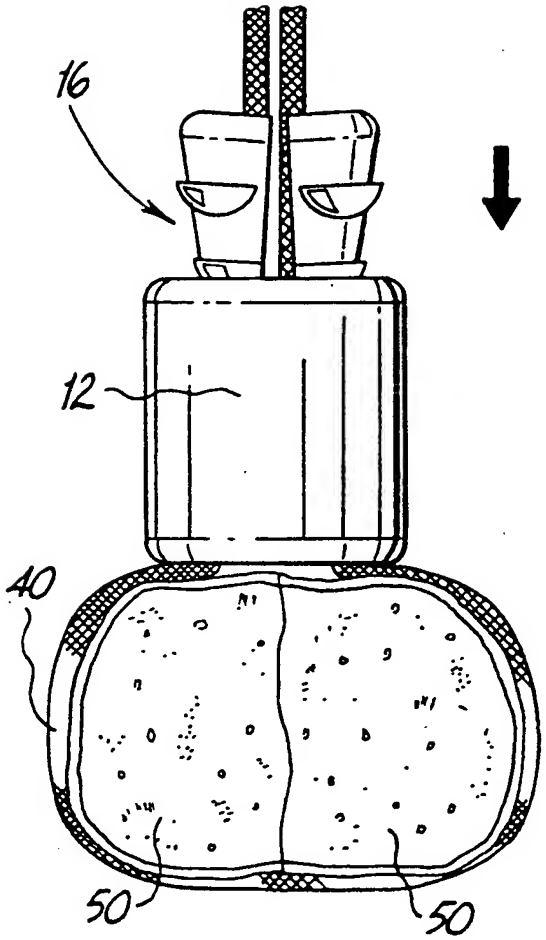

FIG. 6

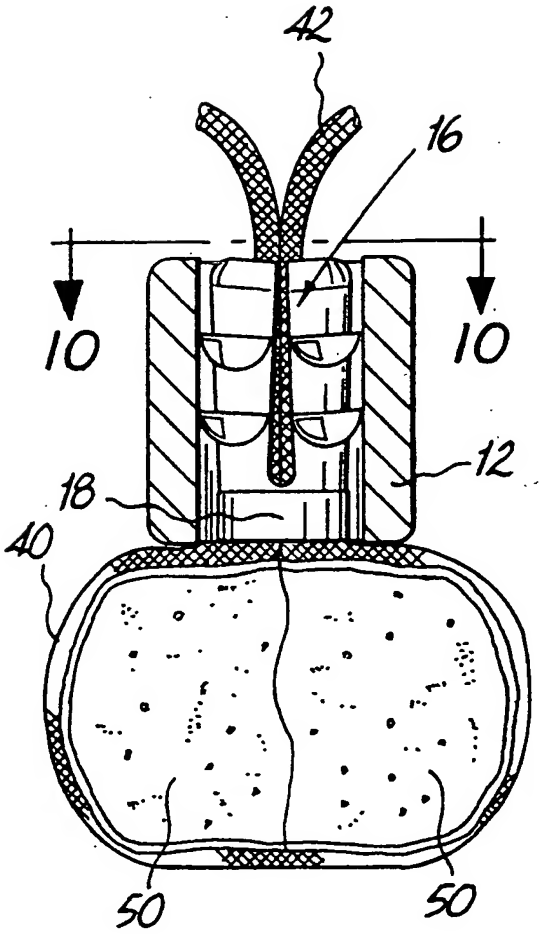

FIG. 9

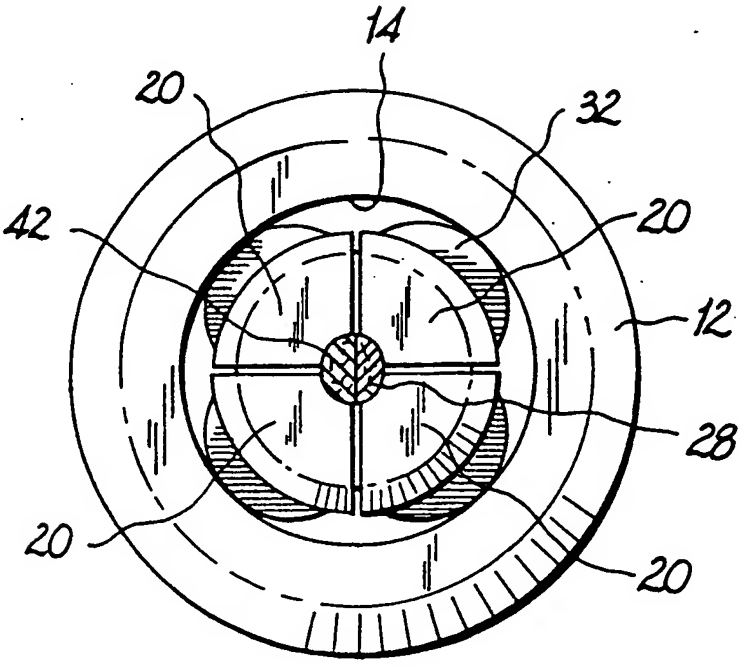

FIG. 10

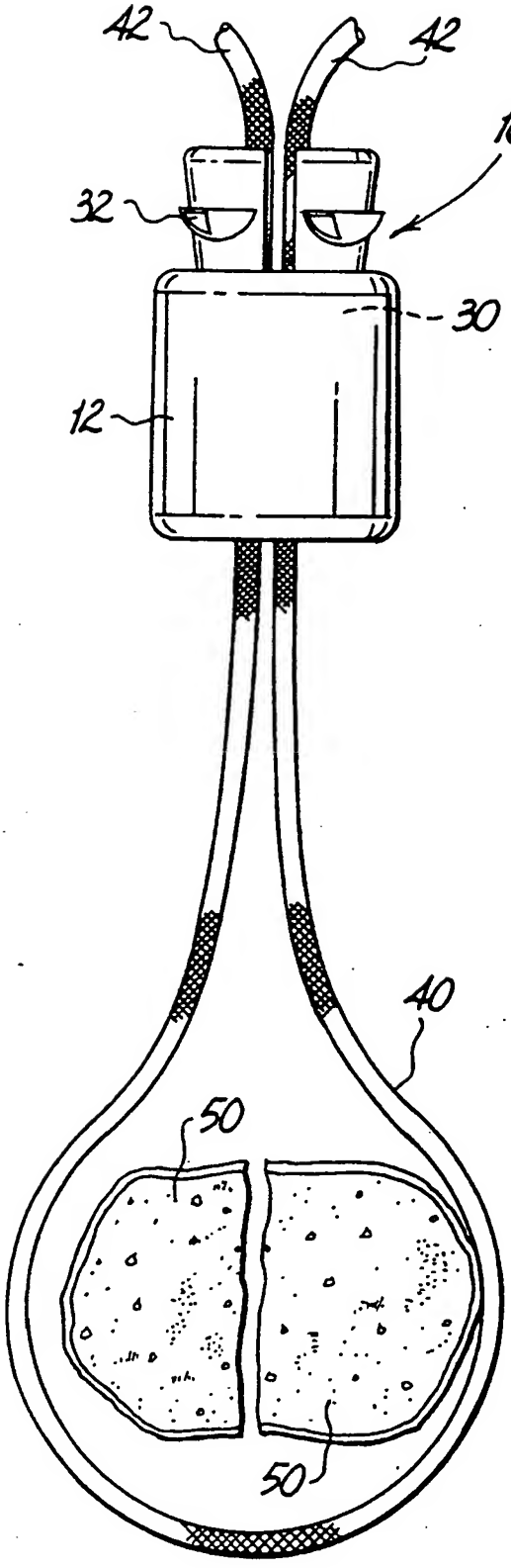

FIG. 7

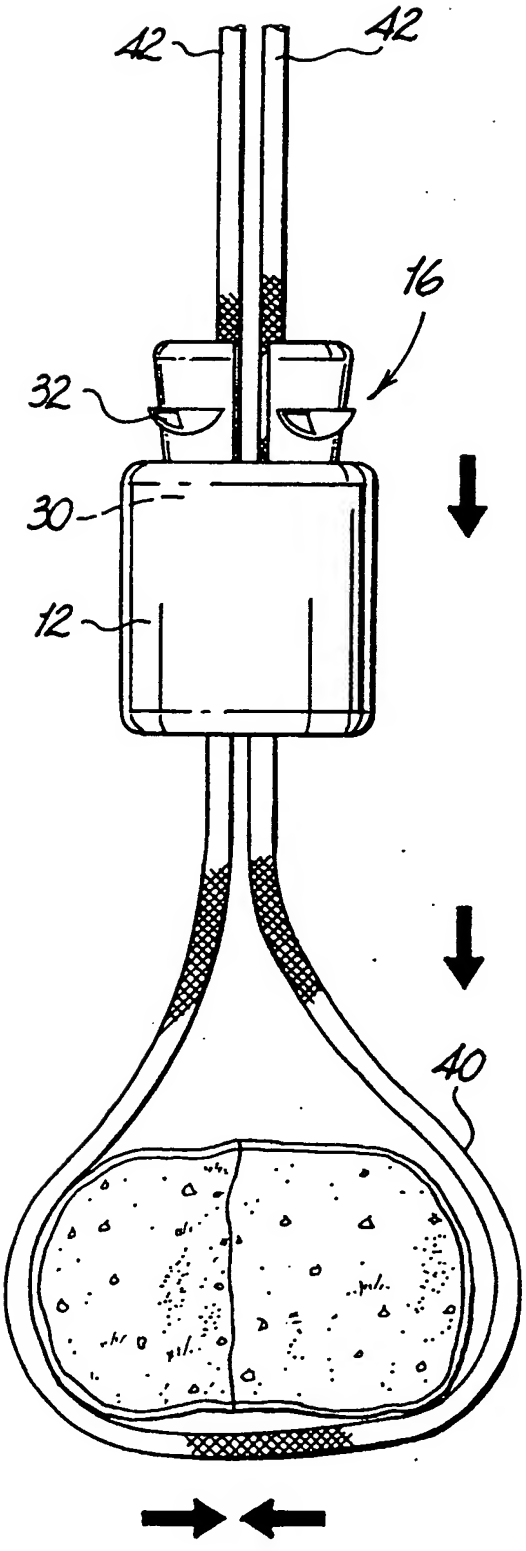

FIG. 8

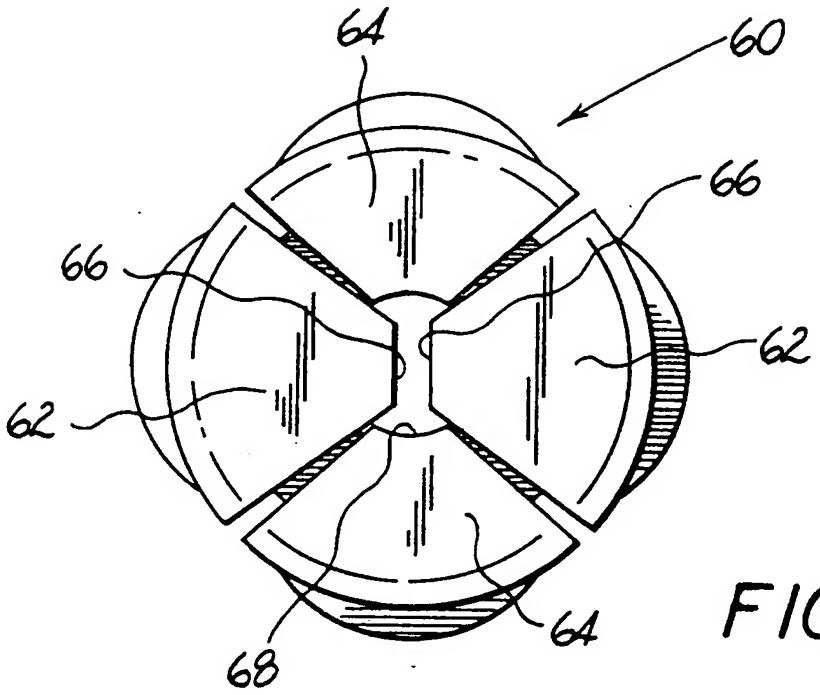

FIG. 11

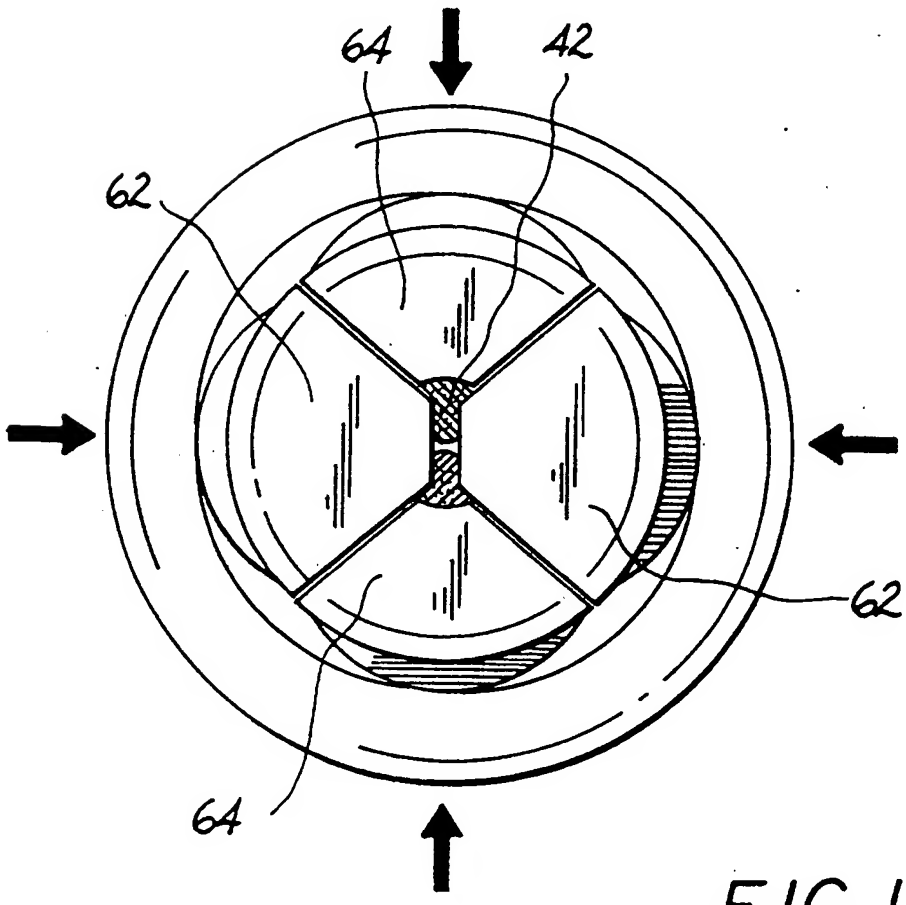

FIG. 12